REMARKS

Claims 72-90 are rejected. Claims 1-71 have been canceled. Claims 91-109 were withdrawn from further consideration and are now cancelled without prejudice to persue in a divisional application. Claims 72-90 are presently pending in the application. Favorable reconsideration of the application in view of the following remarks is respectfully requested.

Non-Compliant Amendment:

Applicant hereby submits this amendment with the appropriate extension of time available under 37 CFR 1.136(a) complying with the corrections required under the office communication dated April 25, 2007. Therefore, in view of the following remarks, reconsideration of the Office Action dated October 11, 2006 is respectfully requested.

Restriction Requirement:

Referring to Sections 1-3 of the Office Action dated October 11, 2006, Applicant confirms the election of claims 72-90 without traverse and the withdrawal of claims 91-108.

Rejection of Claims 80-83 and 88-90 under 35 U.S.C. § 112, First Paragraph:

The Examiner indicates in Sections 4-5 of the Office Action dated October 11, 2006, that Claims 80-83 and 88-90 are rejected under 35 U.S.C. §112, first paragraph, because the specification while being enabling for the inclusion of nucleic acids in circuit elements including resistors, transistors and diodes, does not reasonably provide enablement for incorporation of nucleic acids into circuit elements including capacitors and inductors. The Applicant respectfully disagrees.

The rejection erroneously includes claims 80, 81, 82. By its own terms, the rejection admits that the disclosure enables "the inclusion of nucleic acids in circuit elements including resistors, transistor and diodes.. . . ." See Section 4 of the Office Action dated October 11, 2006. Claim 80 is directed to a diode and claims 81 and 82 include no reference to capacitors or inductors. The subject matter of claims 81 and 82 are similar to the subject matter claims 73-75 which are not included in the rejection under 35 U.S.C. § 112, first paragraph.

Applicant believes the rejection of claims 80-82 was made in error and request the examiner withdraw the rejection as to those claims.

The nature of the invention:

Biology is one of the most unpredictable of the arts. However, Applicant is not relying on in vivo effects. Rather the nucleic acid molecules are used as a template for forming electronics. Manipulations of nucleic acid molecules through hybridization and molecular biology techniques are well understood and readily repeatable by those skilled in the art.

Applicant submits that capacitors and inductors are very well known circuit elements. Fundamental physics tells us that two nearby insulated conductors of any shape form a capacitor.[1] The dielectric of the insulators on the conductors and the length of the insulated conductors determine the capacitance of the device, regardless of these specifications, two insulated conductors form a capacitor. The dielectric strength depends upon the dielectric constant of the insulator. That is a material property that is either known or measurable by conventional techniques. An inductor can be a coiled wire.[2] Coiled wires of all shapes and sizes, whether close-packed or not, and whether they contain iron or other magnetic material or not, are an inductor. The variation of these features are mere design optimizations known to those skilled in the art.

Breadth of the claims:

The claims require a circuit element, including capacitors and inductors, having a nucleic acid template with two or more sequential regions that are coated with different materials that are at least partially conductive.

Quantity of experimentation:

The fundamental building blocks of for forming nucleic molecule support structures are known as disclosed by Chen et al., "Synthesis from DNA of a Molecule with the Connectivity of a Cube," Nature 350:631-633 (1991), which is incorporated by reference in

[1] Aee Appendix 1, *Physics for Students of Science and Engineering, Part II,* Halliday & Resnick, pp. 651,652 (1960. 1962).
[2] Appendix 2, *Physics for Students of Science and Engineering, Part II,* Halliday & Resnick, pp. 807,-809 (1960. 1962). Note the example on page 809 is for an inductor with no iron.

column 6, lines 59 – 63 of the specification. Furthermore, column 13,, lines 6 – 33 of the specification discloses numerous references incorporated by reference that disclose DNA used to form metal or metal composite wires. Examples 4 and 5 of the specification specifically disclose formation of an inductor and a capacitor respectively. Therefore, based on the teachings of the prior art and the specification, the required experimentation is low.

The unpredictability of the art and the state of the prior art:

The Examiner relies on Tan to indicate a common problem with moleeular circuitry namely, the difficulty in connecting various molecular circuit elements. This is the precise problem that the current invention overcomes. Nucleic acid molecules carry information in the nucleic acid base sequence that can be used to direct the interactions of various components. The nucleic acid molecule template allows for "smart" substrates which now have the information needed to direct their own assembly. Specific sequences associated with one electronic element can be used to hybridize with the complementary sequence associated with a second element with a high degree of specificity. As discussed above, the references incorporated by reference elaborate on these procedures.

Applicant agrees with the finding of the rejection "Tans is not directed specifically to the formation of electronic devices patterned on nucleic acid molecules or nucleic acid molecules or networks of nucleic acid molecules." Office Action dated October 11, 2006, page 5. However, Applicant traverses the analogy and conclusion that "the issues which apply to the nanotube [of Tans] are applicable to any variety of circuit elements formed using a variety of nanoscale molecules." *Id.*

Applicant relies upon the demonstrated (and admitted) predictability the template for assembling together different nucleic acids. That within itself, makes the invention different from Tans, which does not have a reliable template for fabricating structures. The connectability of nucleic acids is demonstrated, unlike the erratic connectability of Tans' carbon nanotubes.

The rejection draws a conclusion that because the invention and Tans deal in nanoscale structures, they will experience the same problems. That conclusion is unsupported by any evidence. In fact, the evidence is to the contrary. Because the connecting technique of

(..continued)

the claims is different from that of Tans, it is likely the claimed embodiments will not experience the difficulties reported by Tans.

The Examiner relies on Nishino to show that there is high level of unpredictability in the art of capacitor formation. This finding is clearly erroneous.

The phenomena of capacitance were reportedly discovered in 1745 by Ewald Georg von Kleist of Pomerania who invented the first recorded capacitor: a glass jar coated inside and out with metal. http://en.wikipedia.org/wiki/Capacitor. Others report that current world wide capacitor production is in the hundreds of billions of units. hhtp://www.emsnow.com/newsarchives/archivedetails.cfm?ID=5062. In addition, many integrated circuit components form capacitors on or in semiconductor substrates.

Applicant is not required to document the history of capacitor technology which extends back over 250 years. Perhaps Nishino has difficulties with making his capacitors, but his difficulties are not representative of capacitors in general or of the capacitors claimed in this application. The rejections fail to establish any nexus between Nishimo and the invention. Moreover, the fundamental simple structure of a capacitor (two insulated wires) is clearly enabled by the specification.

Nishino specifically indicates that "although sufficient research and development is being done on solid electrolytic capacitors **based on organic materials**, because of the inefficient capacity achievement rate, this type of capacitor has yet to reach practical application" (emphasis added). Nishino is discussing capacitors where the capacitive material is organic. In the present invention, the nucleic acid molecule, the organic component, is utilized as a scaffold for the formation of a capacitor. The nucleic acid molecule is then coated with a capacitive material. The capacitive material can be any traditional material which can be targeted to the nucleic acid molecule, including metals, doped metals, and conductive plastics. Therefore, the capacitors of instant invention contain traditional capacitive material, and are not based on the inefficient organic materials as noted by Nishino.

The Examiner relies on Cornett to indicate the problems associated with the formation of inductors on the surface of an integrated circuit. The current invention is not limited to the formation of electronic elements on the surface of a chip and therefore overcomes many of these problems. The instant specification discloses forming a coiled wire, which by definition, is an inductor. Nucleic acid molecules can be made into three dimensional structures

which can not be formed on the surface of a chip. Furthermore, nucleic acid molecules can be isolated in many different lengths allowing for relatively large scale structures, when discussing integrated circuits.

Applicant traverses the finding that fabricating inductors on integrated circuits is unpredictable. Attention is directed to United States Patent 4,001,711 Knutson, et al. issued January 4, 1977. This appears to be an early patent showing a spiral inductor on a semiconductor substrate. At key word search of the USPTO database of issued patents using the search terms "semiconductor" and "spiral inductor" finds over 500 hits. While Cornett may have problems with his inductors, those problems are not representative of the state of the art.

Applicant also traverses the finding that Cornett demonstrates unpredictability. Cornett reports a constant inductance up to 3 gigahertz and a high quality factor. Applicant believes that report is evidence of success and consistency and not unpredictability.

The specification shows how to coat nucleic acid with a metal. When the DNA on the histone-like protein is coated with metal, one forms an inductor. No further disclosure is required for enablement.

Working examples:

An applicant need not have actually reduced the invention to practice prior to filing. "The mere fact that something has not previously been done clearly is not, in itself, a sufficient basis for rejecting all applications purporting to disclose how to do it." *Gould v. Quigg*, 822 F.2d 1074, 1078, 3 USPQ 2d 1302, 1304 (Fed. Cir. 1987). An example may be a prophetic or working example.

The working examples relied upon the enablement of joining together pieces of nucleic acid as well as the techniques of coating the nucleic acid with different materials. As shown above, capacitors and inductors are simple structures that can be readily fabricated using the disclosed techniques of the invention.

Guidance in the specification:

The Examiner indicates that Figure 4 provides a basic understanding of how the inducer would be formed, but does not show how the element would be made or how the metal wire would maintain its structure. As disclosed in Example 4, the DNA molecules wrap around

the histone protein to form a compact coil. This is a naturally occurring process that is known to those skilled in the art. The conductive material is then applied to the DNA molecule as discussed in column 13, lines 6 – 33 of the specification. The inductor can maintain its structure by numerous methods apparent to those skilled in the art such as, leaving the histone, relying on the rigidity of the metal coating, or applying a second ridged coating over the metal.

Referring to the capacitor the, Examiner indicates that capacitors have multiple components and several associated factors which impact the function and electrostatic capacity of the capacitor. The instant specification discloses forming two conductive plates with a dielectric between them. By definition, this is a capacitor. Reference to materials, size and spacing are merely design optimizations and are known to those skilled in the capacitor arts.

Level of skill in the art:

As indicated by the Examiner, the level of skill in the art is high.

Conclusion:

The current invention overcomes the problems traditionally associated with molecular electronics and general capacitors. Furthermore, the materials and structures needed to fabricate capacitors and inductors are well known in the art and these materials and structures can be repeatedly replicated using the nucleic acid molecule as a template. The nucleic acid molecules perform a structural role and are not themselves electronically active. Together with the high skill level in the art, undue experimentation would not be required to perform the methods in the claimed invention. Therefore, it is respectfully requested that the present specification provides sufficient enablement for inductor or capacitor having a nucleic acid template.

Rejection of Claims 72-90 on Grounds of Nonstatutory Obvious-Type Double Patenting:

In Sections 6 of the Office Action dated October 11, 2006, the Examiner has rejected Claims 72-90 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-10, 15-17, 20-21, 24-25, 32-35, 38 and 44-46 of U.S. Patent No. 6,664,103 ('103 herein).

The rejection under the doctrine of non-statutory obviousness-type double patenting in view over claims 1-10, 15-17, 20-21, 24-25, 32-35, 38, and 44-46 of U.S. Patent No. 6,664,103 ('103 herein) is moot in view of the terminal disclaimer filed April 5, 2007.

Rejection of Claims 72, 74-76 and 84 under 35 U.S.C. § 102(b) over Hollenberg:

In Sections 7-8 of the Office Action dated October 11, 2006, the Examiner has rejected Claims 72, 74-76 and 84 under 35 U.S.C. §102(b) as being anticipated by Hollenberg et al (US Patent 5,561,071; October 1996). The Applicant respectfully disagrees.

Hollenberg does not teach or suggest, "two or more sequential regions which are coated with different materials" as recited in claim 72. The Office's attention is respectfully directed to Figure 1 in Hollenberg which illustrates a shadowing technique to deposit a conductor. In this shadowing technique a substance B is deposited leaving an uncovered track adjacent to a DNA strand (Step 1); a substance C is deposited at the uncovered track (Step 2); the DNA and substance B are removed (Step 3); and a substance D is deposited on substance C and substrate A, but not on the DNA strand which has already been removed (Step 4). Accordingly, the deposition of different materials in Hollenberg is after the DNA strand is removed and is not along sequential regions of the DNA strand. With the present invention, by having two or more sequential regions along a length of the template coated with different materials, different types of circuit elements can be formed, such as the resistor and diode shown in Figure 1 and 2 of the current application. Accordingly in view of the foregoing comments, the Office is respectfully requested to reconsider and withdraw this rejection. Since claims 74-76 and 84 depend from and contain the limitations of claim 72, they are distinguishable over the cited reference and are patentable in the same manner as claim 72.

Rejection of Claim 77 under 35 U.S.C. § 103(a) over Hollenberg in view of Huber:

In Sections 9-10 of the Office Action dated October 11, 2007, The Examiner has rejected Claim 77 under 35 U.S.C. §103(a) as being unpatentable over Hollenberg as applied to claims 72, 74-76 and 84 above, and further in view of Huber et al (FASEB, 1993, vol. 7, p. 1367-1375). In view of the above remarks regarding Hollenberg, the Applicant respectfully requests the Office to withdraw this rejection.

As discussed above, Hollenberg does not teach or suggest, "two or more sequential regions which are coated with different materials" as recited in claim 72. Huber does not teach this limitation and therefore does not overcome the deficiency of Hollenberg. Since claims 74-76 and 84 depend from and contain the limitations of claim 72, they are distinguishable over the cited reference and are patentable in the same manner as claim 72.

Conclusion:

In Section 11 of the Office Action dated October 11, 2006, the Examiner indicates that the following references may be of interest, Braun et al. (U.S. 6,964,675; September 2005 and WO99/04440; January 1999). Applicant has reviewed the references and believe that the presently claimed invention is patentable at least for the reasons discussed above.

In view of all of the foregoing, applicant submits that this case is in condition for allowance and such allowance is earnestly solicited.

Respectfully submitted,

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